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By WILLIAM MORTON WHEELER

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Family Silvanidæ Böving.

Oryzæphilus surinamensis L. (Fig. 7.) The "saw-toothed grain-beetle" the most abundant, most widely distributed and best-known species of the family.¹ It is cosmopolitan and gregarious; living in nearly all stored human foods of vegetable origin; cereals (rice, wheat, maize, barley, etc.), ground or unground or in the form of paste (macaroni), bread etc.; dried fruits, nuts, copra, more rarely in sugar, starch, drugs, tobacco, snuff or dried meats. The larva, which is very active, is also gregarious, living with the beetles and evidently capable of thriving on most of the substances mentioned (Glover, 1869; Guillebeau, 1890; Chittenden, 1895, 1897, 1911; J. B. Smith, 1909; Girault, 1912). When ready to pupate it may make a rude cocoon by agglutinating particles of food detritus with an oral secretion. The pupa is sometimes free, however, i. e., not inclosed in a cocoon, and is attached by its hind end to the shrivelled larval skin which has been previously attached to the substratum (Blisson, 1849; Coquerel, 1849; Chittenden, 1895). During the summer the whole life-cycle requires about twenty-four days, in spring from six to ten weeks. There are six or seven generations a year in the latitude of Maryland, and in that latitude it winters over as an adult (Chittenden, 1895). It seems to be present wherever the Indian-meal moth (*Plodia interpunctella*) is found (Chittenden, 1897) and has often been found living with another common grain-pest, the Curculionid *Calandra oryzae* (Perris, 1853; Ganglbaur, 1899). In England and Scotland the beetle has been repeatedly taken out of doors

¹I find that this or one of the closely allied species is figured by Redi (1671) who refers to it as "vermiculus qui condita arrodit" and "vermis conditorum et pharmacorum." Redi also figures the grain weevil, *Calandra oryzae*.

under the bark of trees (Fowler, 1889; Champion, 1896). "As an instance of unusual trouble caused by this insect may be mentioned the case cited by Taschenberg of the beetles having invaded sleeping apartments adjoining a brewery where stores were kept and annoying the sleepers at night by nipping them in their beds" (Howard and Marlatt, 1896).

Oryzaephilus mercator Fauvel.—The "merchant grain-beetle," very similar to the preceding, cosmopolitan, and recorded as living in and feeding on pea-nuts, English walnuts, wheat, corn-meal, cereipo fruit (*Myrospermum frutescens*), candle-nuts (*Aleurites moluccana*), and dried currants (Guillebeau, 1890; Chittenden, 1897, 1911). It has been taken under the bark of plane-trees in France, in the neighborhood of mills (Guillebeau). Champion (1896) records it as occurring in shipments of pea-nuts at Rouen in company with another grain-beetle, the Tenebrionid *Palorus subdepressus* Woll. "The close relationship of *mercator* and *surinamensis* makes reasonably certain their identity as regards development, nor is it probable that they differ in any degree in food-habits" (Chittenden, 1896).

Oryzaephilus bicornis Erich.—Cosmopolitan, but less widely distributed and more southern than *surinamensis*. Lives and breeds in wheat and dried figs in France; also taken in rubbish at the base of fig-trees (Guillebeau, 1890; Chittenden, 1897).

Oryzaephilus gossypii Chitt.—Cosmopolitan; breeding in cotton-seed (Chittenden, 1897).

Silvanus bidentatus Fabr.—Europe and United States (N. J., Ind., Conn., So. Cala., Fla.). Under chestnut bark in the United States (Glover, 1869). Recorded as occurring under bark of oaks and firs in England (Fowler, 1889), of firs in Germany (Reitter, 1911), of poplars, elms and figs in France (Picard, 1919). J. B. Smith (1909) records it as occurring under bark throughout New Jersey, as not rare, and as taken most of the season. According to Picard it has the same mode of life as the species of *Laemophloeus* (q. v.).

Silvanus gemellatus Duv.—Cuba and Southeastern States to New York. Lives and breeds in maize in the field as well as in granaries, also in wheat and over-ripe or dried fruits. It nearly

always first destroys the germ of the kernel and hence causes considerable injury to seed maize in the Southern States. "It is essentially an out of doors species, but when conditions favor its increase may become a serious pest in granaries, as it is capable of breeding from egg to adult in the short period of three weeks" (Chittenden, 1897, 1911).

Silvanus unidentatus Fabr.—Europe. Perris (1853, 1876) states that the larva is common in France under the bark of oak, poplar, chestnut and willow, rarer under pine bark. It is agile and photophobic and lives gregariously with the adult beetles among the detritus left by the larvæ of *Bostrychus*, *Cerambycids* and *Buprestids*. In Germany under elm bark (Kaltenbach, 1874); in Britain under bark of beech, oak, horn-beam, etc. (Fowler, 1889), of deciduous trees in general (Reitter, 1911).

Silvanus fagi Guérin.—Europe. Under beech bark; in England in dead branches of fir (Fowler, 1889); in Germany under fir bark and fir-cones (Reitter, 1911).

Silvanus planatus Germ.—Eastern United States (N. J., Ind., Fla.). Under pine-bark in New Jersey (J. B. Smith, 1909).

Cathartus advena Waltl.—Cosmopolitan. Lives and breeds in stored wheat, rice, corn in stack, grain, meal, middlings, flour, dates, figs, lichi nuts, table beans, cacao-beans, edible tubers, etc., but apparently only when these substances are not kept dry and clean. "In breeding experiments recently conducted by the writer it failed to develop in fresh grain or meal, but bred freely in corn-meal which was moistened and produced mold. The beetles particularly fed freely on the molds, of which there were three or four species, and it would appear that this is the normal habit of the insect" (Chittenden, 1897). Pierce (1917) cites *C. advena* among the insects infesting teak in India, stating that it "breeds in leaves, forming galls, causing leaves to drop" (*sic!*). Perris (1876) found the larva in lichi nuts in company with larvæ of *O. surinamensis*. Fowler (1889) states that *C. advena* is sometimes found out-of-doors in England and that Waterhouse took it under cut grass. In New Jersey it is "rare under bark; more common in stored grain, fruits, nuts, etc., particularly such as are spoiled" (J. B. Smith, 1909).

Cathartus cassiæ Reiche.—Cuba and Southern States. Glover (1869) describes the larva as feeding on maize kernels, near the germ, and also on the exposed seeds of cotton bolls. Doran (1892) found this beetle breeding in bran and middlings and producing a temperature 42 deg. F. higher than that of the room in which it was living!

Cathartus longulus Blatchley.—Indiana. "Sifted from borders of Sphagnum marsh" (Blatchley, 1910).

Cathartus excisus Reitter.—Taken in Germany in Havana tobacco (Ganglbaur, 1899; Reitter, 1911).

Cathartus quadricollis Guérin.—Imported into Germany in Havana tobacco and also in the fruits of *Cassia fistula* (Ganglbaur, 1899); imported in Havana cigars (Reitter, 1911).

Nausibius clavicornis Kug.—Cosmopolitan. "Under bark and in sugar" (Glover, 1869). "Often found on ships in plant wares. It also lives in old nests of South American bees" (Ganglbaur, 1899). Introduced into Britain, found in sugar, etc. (Fowler, 1889). In New Jersey under bark and also occasionally in store-houses (J. B. Smith, 1909). In Indiana "two specimens were taken with a dozen other species at sap beneath the bark of a soft maple tree. Leconte states that it occurs usually in rice, sugar and other articles of commerce throughout the United States" (Blatchley, 1910).

Telephanus velox Haldem.—United States (N. J., Ia., Ind., Conn.). "Very common under rubbish of all sorts and as its name implies, runs with remarkable swiftness" (Casey, 1884). "Occurs more often beneath stones, chunks and dead leaves than beneath bark. When exposed it usually remains quiescent with antennæ folded against sides; but if touched it runs with great swiftness, whence its specific name" (Blatchley, 1910). "Throughout the State (N. J.) under stones and old leaves; rarely under bark; may be sifted out from fall to late spring" (J. B. Smith, 1909).

Family Cucujidæ (Böving emend.)

Cucujus clavipes Fabr.—Atlantic States to Illinois and Iowa; a beautiful scarlet red insect, represented in the Pacific States

by the var. *puniceus* Mann. The larva is said to be predatory (Le Baron, 1874; J. B. Smith, 1909). Le Baron (1874) figures the larva; Dimmock (1884) records the adult beetle as occurring under decaying butter-nut bark. Hamilton (1886) gives the following account of the insect: "The very depressed form of this well known beetle indicates, *a priori*, its subcortical habit, and no other has power to adapt its tastes to a greater variety of timber—locust, maple, oak, hickory, gum, buckeye, etc.—are all alike to it. The larvæ do not eat the wood nor the bark, living apparently on the moisture existing between the two. They are elongate, much depressed, brownish yellow, and scarcely to be distinguished from those of *Dendroides canadensis*. Sometime in September, the larva having matured, constructs a circular cell from small particles of the decaying bark and wood, and in this completes its transformations before severe frost, but the beetle does not quit the cell till the following spring. I have never known any of these insects to be taken elsewhere than under bark, though they undoubtedly fly, being possessed of a good pair of wings. On the 10th of October, fifteen newly disclosed individuals and several pupæ were taken under the bark of a gum log; the latter are depressed like the beetle, pale at first, the eyes, antennæ and portions of the legs gradually changing to black, and the elytra becoming red after disclosure. This insect is annual."

Cucujus haematodes Erich.—Europe. In Germany under bark of maples, rarer under bark of fir-stumps (Reitter, 1911).

Cucujus cinnaberinus Scop.—Europe. Habits like those of *haematodes* (Reitter, 1911).

Dendrophagus crenatus Payk.—Europe. In Germany under oak bark; gregarious (Kaltenbach, 1874); in Britain under bark of fir (*Pinus sylvestris*), less frequently under bark of larch (*Larix europæa*) (White, 1872; Fowler, 1889). According to White the larva has been supposed to be carnivorous, but is truly phytophagous, feeding on the decaying inner bark of dead and usually prostrate trees of the species mentioned. The beetles are agile and seem to come out at night and run about on the bark. The eggs seem to be laid in the spring by hibernating females; the larvæ feed twelve to fourteen months, becoming pupæ during

the second summer, the beetles emerging in August. The larva is very quick and agile and when disturbed moves the hinder part of its body quickly from side to side. When about to pupate "it attaches itself firmly to a piece of bark by the thirteenth segment, and the pupa remains attached by its anal segment to the larva-skin." Perris (1876) believes that White is mistaken in his account of the food-habits of the insect, and that it is carnivorous or coprophagous, like *Brontes planatus* (q.v.).

Emporius signatus Frauent.—Imported into Germany from the tropics in Havana cigars (Ganglbaur, 1899).

Pediacus depressus Herbst.—Recorded from Europe, Vancouver and the United States (So. Cal., Mich., Lake Superior, Colo., Pa., S. C.). In Britain under oak-bark, in mold-like fungus; also in stores on board a yacht (Fowler, 1899). Under bark of deciduous trees in Germany (Reitter, 1911).

Pediacus fuscus Erich.—Europe and North America, Alaska, Labrador, British America, Mich., Neb., Colo., N. Mex., Lake Superior, and probably cosmopolitan. In Germany under pine and oak bark (Reitter, 1911), and under the bark of firs (Kaltenbach, 1874). In Britain under bark and in chunks of freshly cut oak, beech and horn-beam (Fowler, 1889).

Brontes planatus L.—Europe. Perris (1853) describes the larva as livid reddish, punctate with carmine dots, and as being very agile and supple. In France it is common throughout most of the year under the bark of various trees, but most often under oak or pine bark. Perris believes the larva to be carnivorous, because it is always found among the larvæ of *Tomicus* or with Poduri or mites 'dont elle fait, sans doute, sa nourriture.' "When about to pupate it attaches itself to a flat surface by means of the tubercle of its last segment, then the skin splits along the back and is pushed back to the posterior end of the body, where it remains much wrinkled." In Germany under bark of deciduous trees, especially of oaks (Kaltenbach, 1874; Reitter, 1911); in Britain under bark of dead beech trees (Fowler, 1889). According to Perris (1876) the larva is predaceous and a scavenger, living under the bark of various trees, including, chestnut, especially where the larvæ of other

beetles have lived. All the stages are passed through in several months, the young larvæ being found in the spring, the adults in late summer. The latter hibernate under the bark. According to Ganglbaur (1899) the larva is "undoubtedly carnivorous."

Psammoechus bipunctatus Fabr.—Europe. Recorded in Britain from marshy places at roots of grass and in refuse (Fowler, 1889); in Germany on the banks of streams or ponds under dead rushes (Ganglbaur, 1899; Reitter, 1911).

Psammoechus desjardinsi Guérin.—Cosmopolitan (Casey, 1884); Florida (Leng, 1920).

Family Laemophloeidæ Böving.

Laemophloeus alternans Erich.—Cosmopolitan; "found everywhere" (J. B. Smith, 1909). In Germany under bark of conifers in galleries of beetles of the genus *Pityogenes* (Reitter, 1911). In France occurring occasionally in the galleries of *Hypoborus ficus*, a bark beetle of fig-trees, but also in galleries of other bark beetles in other plants (Perris, 1853; Picard, 1919).

Laemophloeus ater Oliv.—Europe. In France in dead or dying stems of broom and gorse, preying on the larvæ of the bark-beetle *Hylesinus rhododactylus* (Perris, 1853). In dead stems of broom and under elm-bark in Britain (Fowler, 1889). Rare under bark; common in bran and middlings in Germany (Reitter, 1911). Occurs in France not only in the galleries of *Hypoborus ficus* in fig-bark, but also in the galleries of other Scolytids in other plants (Picard, 1919).

Laemophloeus biguttatus Say.—United States (Ind., Neb., Fla., So. Cal., N. J.). Throughout the State of New Jersey under bark; fall to mid-summer. (J. B. Smith, 1909.)

Laemophloeus bimaculatus Payk.—Europe. Under bark of oak, beech and horn-beam in Britain (Fowler, 1889); in Germany under beech bark (Reitter, 1911).

Laemophloeus castaneus Erich.—Europe. Under birch and chestnut bark in Germany (Reitter, 1911).

Laemophloeus corticinus Erich.—Europe. Under oak-bark in Germany (Reitter, 1911).

Laemophloeus clematidis Erich.—Europe. In *Clematis vitalba*. A constant companion of *Xylocleptes bispinosus*, feeding on the refuse and dejecta in its galleries (Perris, 1853; Kaltenbach, 1874; Reitter, 1911). In dead stems of *Clematis vitalba* in Britain (Fowler, 1889).

Laemophloeus denticulatus Preysl.—Europe. "The larvæ probably merely accompany the larvæ of really injurious xylophagous beetles. According to Hartig they are found in the cones of conifers, according to Ratzeburg also under dead bark, according to Hellwig and Panzer under the bark of linden trees" (Kaltenbach, 1874).

Laemophloeus dufouri Laboulb.—Europe. The larvæ were found by Perris (1853) under pine-bark hibernating in January with the pupæ and beetles in the galleries of *Crypturgus pusillus*. He believed that the larvæ feed on those of the *Crypturgus*, but more probably they merely eat the dejecta in the burrows.

Laemophloeus duplicatus Waltl.—Europe. Under bark of beech, oak, etc., in Britain (Fowler, 1889); in Germany under beech bark (Reitter, 1911).

Laemophloeus fasciatus Mels.—United States (Ind., Pa., Minn.). In Minnesota it "is found under bark, but is also very common near saw-mills, especially in those in which hardwood is sawed. In running over persons engaged in mills it will bite, even without provocation, and may cause bad sores" (Lugger, 1899).

Laemophloeus ferrugineus Steph.—Cosmopolitan (Casey, 1884). In Britain in hay-stack refuse, rarely under bark; also in granaries (Fowler, 1889). In Germany in rice, bran, middlings and meal (Ganglbaur, 1899; Reitter, 1911; Chittenden, 1911). "Its larva, which does not differ from that of other species of the genus, has been described by Carpentier (Bull. Soc. Linn. Nord. France, April, 1877, 3 pp. 239-241). It lives under the bark of oaks, cherry trees and, it is said, in fig-trees inhabited by wood-boring insects, but also in grain attacked by *Calandra*, in bran, flour, etc." (Picard, 1919).

Laemophloeus hypobori Perris.—Europe. (France). Living only in the galleries of a bark-beetle *Hypoborus ficus*, in fig-trees. Both the adult beetles and the larvæ live gregariously and feed on the dejections, exuviae and all kinds of detritus which they find in the empty galleries. They occur more rarely in the brood galleries that are still inhabited by the parent *Hypobori*. Both larvæ and adults are found throughout the year and both stages, but especially the adults, are found hibernating (Picard, 1919). This author gives an excellent account of the beetle and its habits.

Laemophloeus juniperi Grouv.—Europe. Under bark of *Juniperus* in galleries of the bark-beetles *Phloeosinus bicolor* Br. and *thujæ* Perris (Reitter, 1911). "At Montpellier this is the rarest species in fig-trees; I know of only one capture made in August by J. Lichtenstein. *L. juniperi* is nevertheless common in Herault, as in the whole South. I often found it under the bark of elms riddled by *Pteleobius vittatus* and *kraatzi*; it is also found in the galleries of *Hypoborus (Liparthrum) mori* of the mulberry, of *Phloeosinus thujæ* and *bicolor* infesting *Juniperus*, *Cupressus*, *Thuja* and other conifers, of *Phloeotribus scarabaeoides* of the olive, etc." (Picard, 1919). The larva, which is coprophagous and detritivorous, has been observed and described from *Thuja* infested with *Phloeosinus thujæ* by Decaux (Bull. Soc. Ent. France, June 25, 1890, p. 125) and is redescribed by Picard.

Laemophloeus modestus Say.—United States (Tex., Fla., D. C., N. J.). "Taken in hemp-seed, the interior of which had been entirely eaten out" (Glover, 1869). In New Jersey occurring under bark and in siftings (J. B. Smith, 1909).

Laemophloeus monilis Fabr.—Europe. In Germany under beech and linden bark, gregarious in the burrows of *Tachrorhynchus bicolor* (Reitter, 1911).

Laemophloeus perrisi Grouv.—Europe. Occurring in the fig. "It is also known from the *Lentiscus* and pines infested with *Pityophthorus*. This is a Corsican insect, very rare in France, where it has scarcely been seen, except in the Provence" (Picard, 1919).

Laemophloeus pusillus Schön—Cosmopolitan and common (Casey, 1884). In Britain in granaries, imported with grain (Fowler, 1889). Occurs commonly in cereals, but probably in the main predaceous and scavenging (Chittenden, 1911). In rice, grocery wares, etc., in Germany (Reitter, 1911).

Laemophloeus testaceus Fabr.—Europe. Similar to *L. denticulatus* but occurring under linden bark (Kaltenbach, 1874), and under dry beech bark (Reitter, 1911). Perris (1853, 1876) found the larvæ under oak bark in galleries of *Tomicus* and under chestnut bark with the larvæ of the bark beetle *Dryocoetes capronatus* on which it was preying, but also living on the dejections and capable of developing to maturity in the absence of the *Dryocoetes*. Also found under bark of dead oaks with the larvæ of the same Scolytid and in the elm in the galleries of *Hylesinus vittatus* and *kraatzii*.

Laemophloeus turcicus Grouv.—Cosmopolitan. Imported into Germany in dried fruits, especially prunes, from the orient (Reitter, 1911).

Laemotmetus ferrugineus Gerst.—Cosmopolitan. Imported into Germany in rice (Ganglbaur, 1899; Reitter, 1911).

Laemotmetus rhizophagoides Walker.—Cosmopolitan. Found in stored rice in Berlin, Germany (Chittenden, 1911).

Lathropus vernalis Erich.—United States (Fla., Miss., N. J., Conn.). Throughout New Jersey, secured by beating dead branches, May to July (J. B. Smith, 1909).

Lathropus sepicola Müller.—Europe. According to Perris (1876) the larva lives under elm-bark in the galleries of the bark beetles *Scolytus multistriatus*, *Hylesinus vittatus* and *H. kraatzii* and feeds on their dejections. The perfect insect emerges in May. Reitter (1911) often beat the latter from dry wood fences.

Phloeostichus denticollis W. Redtb.—Europe. Under the inner bark of maple-trees, together with the larval stages (Weisse, 1897; Reitter, 1911).

Prostomis mandibularis Fabr.—Europe and Pacific States (Or., Nev., Cala.) and Vancouver. In very rotten, damp wood

of deciduous trees. The larvæ are often present in great numbers with the beetles (Ganglbaur, 1899; Reitter, 1911). Perris (1876) found the larvæ in rotten chestnut wood and states that Curtis, Chapuis and Candèze took them in rotten oak wood.

Hemipeplus marginipennis Lec.—Cited only from Georgia and Florida (Leng, 1920). According to Schwarz a rather abundant species under palmetto bark (Casey, 1884).

Hemipeplus microphthalmus Schwarz.—Cited only from Florida (Leng, 1920), where it was taken flying at night by Schwarz (Casey, 1884).

Inopeplus praeustus Chevr.—Antilles. Adults and larvæ living gregariously in the burrows of a Scolytid in branches of cacao. The larva is peculiar in having the prolongations of the ninth abdominal segment in the form of forceps (de Peyerimhoff, 1903).

Family Scalidiidæ Böving.

Catogenus rufus Fabr.—United States (Ind., Ia., Md., N. C., Fla.). Fiske (1905) has shown that the larva is an external parasite on the larvæ of Braconid Hymenoptera and Cerambycid pupæ; "its habits differing in no essential feature from those of many species of external Hymenopterous parasites. The adult is fairly common throughout the South, and is found beneath the loose bark of recently dead and dying trees, both conifers and deciduous. It occurs at nearly all seasons of the year, but is especially common during the late fall and early spring, and is found hibernating in situations similar to the above mentioned." Fiske seems to have overlooked a note on this beetle by Dimmock (1884), who says: "In Connecticut it is common beneath the loose bark of the trunks of hickory trees, and I have reared its larva which fed upon a pupa of *Elaphidion parallelum*, a borer in hickory."

